MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

BMF1014 – MATHEMATICS FOR FINANCE

(All sections / Groups)

9 MARCH 2020
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **SIX (6)** printed pages with 4 questions only, excluding the cover page.

2. Attempt **ALL FOUR (4)** questions.

3. Write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.

4. Mathematical formula is attached at the end of this question paper.

Question 1 (25 marks)

(a) Find an equation of the line that passes through the points (1, 3) and (2, 5). Then, sketch the straight line represented by the equation.

[7 marks]

(b) A WorkCentre system purchased at a cost of \$50,000 in year 2015 has a scrap value of \$15,000 at the end of 5 years. If the straight-line method of depreciation is used,

(i) find the rate of depreciation.

[2 marks]

(ii) Find the linear equation for the value, $V(t)$ expressing the system's book value at the end of t years.

[3 marks]

(iii) Find the system's book value at the end of six years.

[2 marks]

(c) A division of the Gibson Corporation manufactures bicycle pumps. Each pump sells for RM30 and the variable cost of producing each unit is 36% of the selling price. The monthly fixed costs incurred by the division are RM148,000. What is the break-even point for the division?

[11 marks]

Question 2 (25 marks)

(a) If $A=\begin{bmatrix}-3 & 1\\ 2 & 0\end{bmatrix}$, $B=\begin{bmatrix}-1 & 2\\ 8 & 7\end{bmatrix}$ and $C=\begin{bmatrix}6 & 4\\ 7 & 0\end{bmatrix}$,

(i) find $3A+3B$.

[4 marks]

(ii) Find AC^T.

[4 marks]

(iii) Find X if $3X+A=B$.

[6 marks]

Continued...

(b) Given $A = \begin{bmatrix} 5 & 0 & 2 \\ 2 & 2 & 1 \\ -3 & 1 & -1 \end{bmatrix}$.

(i) Find the determinant of matrix A.

[3 marks]

(ii) Find the minor of matrix A.

[5 marks]

(iii) Find the inverse of matrix A.

[3 marks]

Question 3 (25 marks)

(a) Find the simple interest on a $850 investment made for 3 years at an interest rate of 7% per year. Next, what is the accumulated amount?

[5 marks]

(b) Find the effective rate of interest corresponding to a nominal rate of 6% per year compounded

(i) annually,

[3 marks]

(ii) daily.

[3 marks]

(c) A company establishes a sinking fund for plant retooling in 7 years at an estimated cost RM450,000. How much should be invested semiannually into an account paying 7.89% compounded semiannually?

[6 marks]

(d) A business borrows RM51,800 at 5% interest compounded monthly for 4 years.

(i) What is the monthly payment?

[6 marks]

(ii) How much interest was paid over 4 years?

[2 marks]

Continued...

Question 4 (25 marks)

(a) Find the first derivative of the following function:

$$2xe^{3x}.$$

[6 marks]

(b) The relationship between the unit selling price p (in dollars) and the quantity demanded x (in pairs) of a certain brand of women's gloves are given by the demand equation

$$p = 100e^{-0.0001x} \qquad (0 \le x \le 29{,}000).$$

Find the marginal revenue function.

[6 marks]

(c) If $x^3 - 4x^2y^3 + 4xy^2 = 3$, find the value of $\frac{dy}{dx}$ at the point (2, 1).

[5 marks]

(d) Find the first order partial derivatives for the following function:

$$f(x, y) = e^{xy+1}.$$

[4 marks]

(e) Evaluate the following integral:

$$\int_0^1 \frac{1}{\sqrt{2x+1}}\, dx.$$

[4 marks]

End of Page.

Subject Code: BMF1014
Subject Name: Mathematics for Finance

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2+bx+c=0$ where $a \neq 0$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

2. Simple Interest

(i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)

(ii) Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

(i) Accumulated amount, $A=P(1+i)^n$, where $i=\frac{r}{m}$, and $n=mt$

(m = number of conversion periods per year)

(ii) Present value for compound interest, $P=A(1+i)^{-n}$

4. Effective Rate of Interest

$$r_{eff}=\left[1+\frac{r}{m}\right]^m-1$$

5. Future Value of an Annuity

$$S=R\left[\frac{(1+i)^n-1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R periodic payment)

6. Present Value of an Annuity

$$P=R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R periodic payment)

7. Amortization Formula

$$R=\frac{Pi}{1-(1+i)^{-n}}$$

(R = periodic payment on a loan of P to be amortized over n periods)

8. Sinking Fund Formula

$$R = \frac{Si}{(1+i)^n - 1}$$

(R = periodic payment required to accumulate S over n periods)

9. Basic Rules of Differentiation

(a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x) = 0$

(b) Power rule : If $f(x)$ is x^n, then $f'(x) = nx^{n-1}$

(c) Constant multiple rule: $\frac{d}{dx}[cf(x)] = cf'(x)$ (c is a constant)

(d) Sum rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$

(e) Product rule: If $f(x) = u(x) \cdot v(x)$, then $f'(x) = u(x)v'(x) + v(x)u'(x)$

(f) Quotient rule: $f'(x) = \frac{d}{dx}\left[\frac{u(x)}{v(x)}\right] = \frac{v(x)u'(x) - u(x)v'(x)}{[v(x)]^2}$

(g) Chain rule: $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

(h) General power rule: $\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} f'(x)$

(i) Exponential function: $\frac{d}{dx}(e^u) = e^u[u'(x)]$

(j) Logarithmic function: $\frac{d}{dx}(\ln u) = \left(\frac{1}{u}\right)[u'(x)]$

10. Basic Rules of Integration

(a) Indefinite integral of a constant: $\int k \, du = ku + C$

(b) Power rule: $\int u^n du = \frac{u^{n+1}}{n+1} + C$

(c) Constant multiple rule: $\int kf(u) \, du = k\int f(u) \, du$ where k is a constant

(d) Sum rule: $\int [f(u) \pm g(u)] \, du = \int f(u)du + \int g(u)du$

(e) Exponential function: $\int e^u du = e^u + C$

(f) Logarithmic function: $\int \left(\frac{1}{u}\right) du = \ln u + C$

11. Determining Relative Extremas

$$D(x,y) = f_{xx}f_{yy} - \left(f_{xy}\right)^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y).
If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y).
If $D < 0$, (x, y) is neither maximum nor minimum.
If $D = 0$, the test is inconclusive.